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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTEREFERENCE

Application No.	:	09/921,538
Applicant	:	MICHIO OKAMURA ET AL.
Filed	:	August 3, 2001
Title	:	CARBON MATERIAL FOR ELECTRIC DOUBLE LAYER CAPACITOR, METHOD OF PRODUCING SAME, ELECTRIC DOUBLE LAYER CAPACITOR AND METHOD OF FABRICATING SAME
Group Art Unit	:	1754
Examiner	:	Stuart L. Hendrickson
Confirmation No.	:	8044

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is in support of the Notice of Appeal filed concurrently herewith.

REAL PARTY IN INTEREST

The real party in interest is JEOL Ltd. of 1-2, Musashino 3-chome, Akishima, Tokyo 196-8558, JAPAN.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on September 29, 2003.

Lori A. Fratangelo
(Name of Person Making Deposit)

Lori A. Fratangelo 9/29/2003
Signature Date

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claims 1, 4, 6, and 11 are pending and are finally rejected. Claims 2 and 7 are withdrawn.

STATUS OF AMENDMENTS

All amendments have been entered to claims 1, 4, and 11. Claim 6 is original.

SUMMARY OF THE INVENTION

This application is directed to a unique carbon material and electric double layer capacitors having electrodes prepared from the carbon material. The electrical capacity of the double layer capacitors is related to the ability of the carbon material to accommodate ions between layers of the graphite crystallites by a phenomenon known as "intercalation".

Electric double layer capacitors, also known as EDLCs, supercapacitors, or electrochemical capacitors, have a pair of electrode plates made of activated carbon. The plates are placed opposite each other via a separator. Each plate is impregnated with an aqueous or nonaqueous electrolyte. In the past, it has been considered that the capacitance of the plates is roughly proportional to the surface area of the activated carbon plates. Activated carbon is known for its large specific surface area (m^2/gm). Applicants have found that much more important than surface area is the structure of the carbon and its ability to accept intercalating ions. Applicants have identified an activated carbon material that has relatively low specific surface area, but permits construction of an EDLC that has superior capacity. Applicants have found that an activated carbon material prepared by activating with an alkali and having graphite

cystallites with interlayer distances of 0.365 to 0.385 nm provides superior capacitance in an EDLC.

As is generally understood, carbon in the graphite form comprises loosely attracted layers of carbon atoms having benzene ring-like, two-dimensional structure. The interlayer distance reported for graphite is 0.335 nm.

The manufacture of carbon material according to this invention starts with heating raw carbon source materials to carbonize them, thus growing crystallites of graphite-like carbon. The heat-treated material is then activated with an alkali as explained in the first paragraph under the heading "Example 1" on page 14 of the Applicants' specification. The carbon material activated in this way does not have the high specific surface area typical of the prior art activated carbons. Nevertheless, it provides superior capacity when used in an EDLC.

ISSUES PRESENTED

Whether the claims are patentable (35 U.S.C. §§102(b) and 103(a)) considering the prior art of record.

GROUPING OF CLAIMS

Group I: Claim 1 sets forth a carbon material.

Group II: Claims 4 and 6 are directed to an electric double layer capacitor. Claims 4 and 6 may be considered together.

Group III: Claim 11 sets forth an electric double layer capacitor with a dimension limiting structure.

ARGUMENT

Claim 1

The examiner states:

> Claim 1 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Miyabayashi et al.
>
> The reference teaches in ex 1-1 a material having the claimed d002 spacing. Although it differs in the way it was made, any difference imparted by the product by process limitations would have been obvious to one having ordinary skill in the art at the time the invention was made because where the examiner has found a substantially similar product as in the applied prior art the burden of proof is shifted to the applicants to establish their product is patentably distinct not the examiner to show that the same process of making. see In re Brown, 173 U.S.P.Q. 685, and In re Fessmann, 180 U.S.P.Q. 324. The intended use does not limit the material.

The Miyabayashi et al. patent does not teach a carbon material "produced by activating a carbon material with an alkali."

The examiner cites In re Brown, 173 USPQ 685, which states at page 688 with reference to product-by-process claims: "[w]e are therefore of the opinion that when the prior art discloses a product which reasonably appears to be identical either with or only slightly different than a product claimed in a product-by-process claim, a rejection based alternatively on either section 102 or section 103 of the statute is eminently fair and acceptable." [Emphasis added.]

It is respectfully submitted that in this case, it does not reasonably appear that the products are identical. The fact that the interlayer distance of the product of Example 1-1 of Miyabayashi et al. is just within the claimed range 0.365 to 0.385 nm is not sufficient. The

referenced patent states: "[t]he intensity of a diffraction curve for the same material was weak; d002 = 3.67". Applicants' Example 1 is clearly according to Applicants' claim 1. The diffraction curve for this material is labeled C in Figure 1 of this application. Notably, the diffraction curve has a very strong peak in the range d_{002} = 0.365 to 0.385 (curve C). The prior art is represented by curve B. The Applicants' specification demonstrates that there is a physical difference resulting from the product-by-process limitation recited in claim 1. This is not just an interesting fact, but ties in with the fact that the capacitance of the product of Example 1 of Applicants' specification and, therefore, claim 1 is superior to the capacitance of any other product set forth in Table 1 on page 17 of the specification. Hence, it does not reasonably appear that the carbon material of claim 1 is identical or only slightly different than the material of Miyabayashi et al. Example 1-1. Moreover, there is no suggestion in Miyabayashi et al. to modify the process of Example 1-1 to include the step of activating with an alkali. Miyabayashi et al. only discloses pyrolyzing with an oxidizing gas (water, vapor, or CO_2) alone or mixed with an inert gas.

The examiner states:

> Claim 1 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Takahashi et al.
>
> Takahashi teaches in CE4 active carbon/carbon having the claimed d-spacing. While not teaching how the activation was performed, the material of Takahashi does not appear to differ; where the examiner has found substantially similar product as in the applied prior art the burden of proof is shifted to the applicant to establish that their product is patentably distinct not the examiner to show the same process of making, see above.

The Takahashi et al. patent discloses a carbon material for a lithium secondary (rechargeable) battery comprising an electrode of molded carbon having a workable distance (d0002) within the range 3.38 to 3.56 angstroms (0.338 to 0.356 nm).

In comparative example 4 of Takahashi, a carbon material having a distance (d0002) of 3.65 angstroms is described. It was not, however, activated with an alkali. Moreover, Takahashi et al. explain the carbon material was unacceptable: **"[t]he produced batteries did not function as workable batteries."** (Col. 13, ll. 24–25.) The activation method matters. The comparative example of Takahashi et al. does not anticipate claim 1.

Clearly, the materials disclosed in the Takahashi et al. patent as workable do not anticipate Applicants' claimed material nor does it make the subject matter of claim 1 obvious. Indeed, the disclosure leads one away from Applicants' invention in view of the fact that the comparative material was found not to be workable and the range of workable materials is outside the range claimed by Applicants.

Claims 4 and 6

The examiner states:

> Claims 4, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyabayashi et al.
>
> The reference teaches the carbon, but not a capacitor. However, use in a capacitor is taught in column 12. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the carbon of Miyabayashi as a capacitor because doing so exploits it electrical properties...
>
> Claims 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyabayashi et al as applied to claims 1, 4, and 11 above, and further in view of Suzuki et al.

> Miyabayashi does not teach the claimed solvent/electrolyte. Suzuki does in column 10.

As explained with reference to claim 1, Miyabayashi et al. does not teach carbon activated with an alkali. Concerning claims 4 and 11, Miyabayashi et al. only disclose embodiments for examples of usefulness in lithium batteries. The passing reference in column 12 to capacitors is conjecture, at best. Miyabayashi et al. disclose a range of inner layer distances: d002 = 3.41 Å (0.341 nm) to 3.70 Å (0.370 nm) selected as a preferred range for lithium batteries. The range set forth in Applicants' claims is a critical range for EDLCs.

Claim 11

The examiner states:

> Concerning claim 11, holding plates in a confined structure is an obvious expedient to prevent ruining the battery during shipping. The effect 'limiting expansion' is deemed possessed by the fact that it is a confining structure.

With regard to claim 11, the examiner speculates that "holding plates in a confined structure is an obvious expedient to prevent ruining the battery during shipping." The problem with this is that it is an argument not supported by the facts. The "dimension-limiting structure" of claim 11 is not for the simple purpose of preventing ruining of the capacitor during shipping. The purpose of the "dimension-limiting structure" is to limit expansion on application of voltage. As pointed out in Table 1, the expansion pressures are great (for Example 1, the expansion pressure is 7.5 kg/cm^2). A simple shipping cover could not be expected to confine such pressures. The examiner has cited no reference to support his argument that a "confined structure...to prevent ruining of the battery during shipping" would limit expansion upon application of voltage.

CONCLUSION

It is respectfully urged that the final rejection be reversed.

Three copies of this Appeal Brief are enclosed, along with a check in the amount of $320.00 for the filing fee.

Respectfully submitted,

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APPENDIX

1. A carbon material for an electric double layer capacitor, comprising:

crystallites of carbon produced by activating a carbon material with an alkali, said crystallites having interlayer distances of 0.365 to 0.385 nm.

4. An electric double layer capacitor having polarized plates immersed in an organic electrolyte, said electric double layer capacitor comprising:

said polarized plates being made of a carbon material comprising crystallites of carbon produced by activating a carbon material with an alkali, said crystallites having interlayer distances of 0.365 to 0.385 nm.

6. The electric double layer capacitor of claim 4, wherein said organic electrolyte has a solute consisting of tetraethylammonium tetrafluoroborate.

11. An electric double layer capacitor comprising:

an electrolyte consisting of a nonaqueous solvent;

polarized plates made of a carbon material activated with an alkali having interlayer distances d_{002} of 0.365 to 0.385 nm; and

a dimension-limiting structure in which said electrolyte and said plates are held, said dimension-limiting structure acting to limit expansion of said plates on application of a voltage.